JOHN

A DIRECT RECOM

by M. Sulliv

"The accompanying drawing is a
making and recording Electrical
I have had it in use for some
continuously, I feel sure that
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as this is taken without any
without the patient's aid and
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THE BRITISH JOURNAL

OF

OPHTHALMOLOGY

JANUARY, 1922

COMMUNICATIONS

THE SCOTOMATA OF TOBACCO AMBLYOPIA

BY

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INVESTIGATION of the central zone of the retina, and in particular of the size and shape of the blind spot, by means of the various scotometers now in use, is playing an increasingly important part in the diagnosis of ocular disease. In the amblyopia caused by tobacco it has long been common knowledge that the loss of visual function is confined to the zone of the retina supplied by the papillo-macular bundle of nerve fibres, that the peripheral field is unaffected, and that a central scotoma for red is the most characteristic feature of the disease.

But now that small changes in the acuity of the central retinal zone form so important a factor in the early diagnosis of glaucoma, it is important that more exact knowledge of the various scotomata associated with the different diseases affecting the central retinal zone should be determined.

In my observations upon cases of tobacco amblyopia I have placed most importance upon the results obtained by the use of a white test object. When using coloured test objects additional difficulties arise. It is then not only a question of when the test object becomes noticeable to the patient, but at what point he can appreciate its colour, and a further difficulty is met in trying to make the patient adopt a standard saturation for the colours of the test object, so that he will not signal his appreciation of the

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coloured test object until this standard saturation has been reached. For instance, when moving a red test object from a scotomatous area to a seeing area, the tobacco patient often says that he first sees the red test object as brown in colour, and not until it has been moved further from the scotomatous area does he see it as red in colour.

But red is easier to work with than green. Even to the normal eye a green test object, when moved inwards from the peripheral region of the field, appears white for a considerable period before the green colouration is apparent, and it is a matter of extreme difficulty, even to the normal eye, to decide upon the exact moment at which the green colour is appreciated.

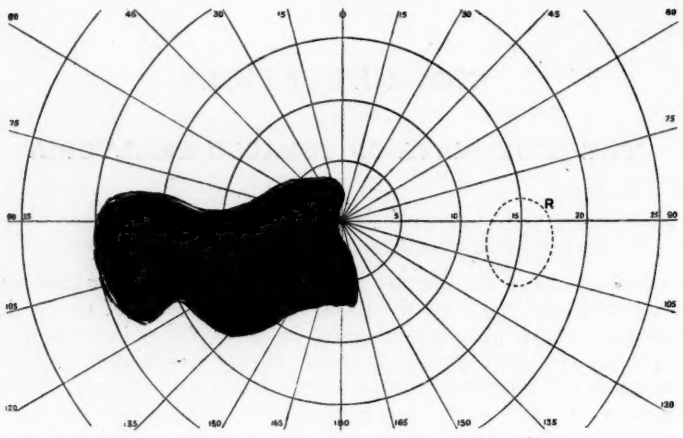


FIG. 1. L.E.

I found, in fact, that the use of a green test object proved so unsatisfactory that I gave up using it as a routine part of the examination, but I may here state that I formed the impression that in tobacco cases the field for green conformed to that for red, though the green scotoma tended to be of a greater size.

There is a further difficulty in that the majority of tobacco patients are not of a high grade of intelligence, and at times may attempt to give the answers which they think will please the observer best. The fixation of the eye must be closely watched all the time, as in all tobacco cases there is some diminution of central visual acuity. Again the process is a very fatiguing one to the patient.

The scotometer which I have used is that devised by Mr. Bishop Harman. I feel very strongly that the Bjerrum screen

used at a working distance of one metre is the method of real accuracy, but it is an instrument for the laboratory rather than for the out-patient room, and at any rate it can always be employed as the final arbiter in a doubtful case.

To begin with, I used the 2 mm. test object for white and red, but when working as a control upon normal eyes I found that with the 2 mm. red test object the red colour was not appreciated outside the 10 degree circle, so for colours I have used a 4 mm. test object.

Turning now to the scotomata which are met with in tobacco amblyopia, there appear to be three types :—

(I) A large scotoma involving the blind spot and the area

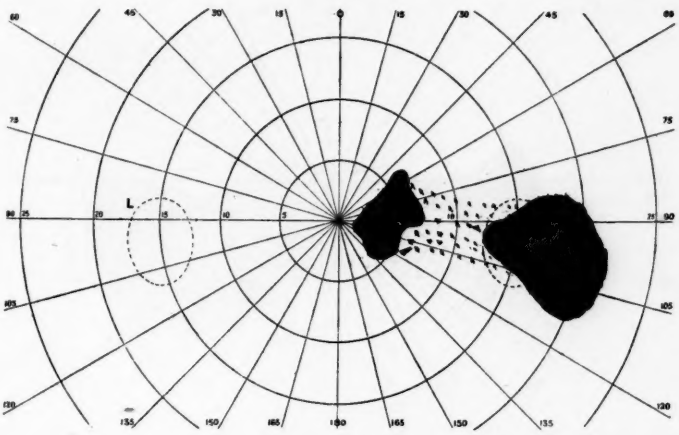


FIG. 2. R.E.

between the blind spot and fixation, but which stops just short of the actual fixation point (Fig. 1).

(II) A scotoma lying close to fixation within the 5 degree circle, connected by a relative area to the blind spot, which may or may not be prolonged towards fixation (Fig. 2).

(III) A scotomatous finger pointing from the blind spot towards fixation (Fig. 3).

The scotomata shown in these charts are absolute scotomata. And it would appear that these three forms demonstrate different degrees of severity of the disease, Fig. I being the most, and Fig. III the least severe. For the most part this is true, and certainly in early cases of tobacco amblyopia a small scotomatous finger, extending from the blind spot towards fixation, is a very constant sign. But the size of the absolute scotoma has no

certain relation to the visual acuity. The whole of the central zone is relatively affected, and the correlation between the absolute and relative scotomatous areas varies from case to case.

The charting of relatively scotomatous areas is a matter of great difficulty. It is easy to find a relative area, but to chart its limits with any accuracy is most difficult. The only satisfactory method is to reduce the size of the test object, and by using the Elliot scotometer or Bjerrum screen with a 2 mm. test object at a working distance of 1 metre, it is possible to delineate a small finger of absolute scotoma extending from the blind spot towards fixation, when, with the Bishop Harman instrument, which has a working

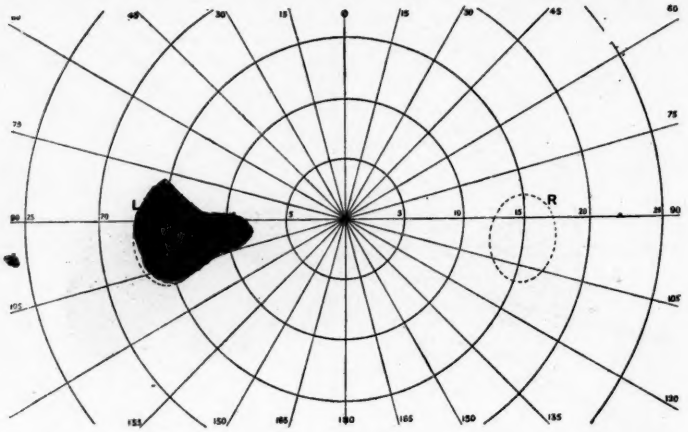


FIG. 3. L.E.

distance of $\frac{1}{3}$ metre, the same sized test object only shows a relative scotoma in this region.

With regard to colours, speaking generally, blue conforms with white and red with green. The relation of red to white is also more or less constant as regards shape, but the area where red is not appreciated is very much larger, and, except in very slight cases, the fixation point is involved.

The following three cases may be considered typical of the condition :—

CASE I (Figs. 4 and 5).—J. W. complains that his vision has been failing for the last two months. He smokes 2 oz. of shag a week, is in good work, and has no worries.

V.R. 6/18, V.L. 6/24 ptly.; no pallor of discs.

After-images, not obtained with red or green; obtained with blue. In the L.E. there is a large scotoma for white extending

from the blind spot to just short of fixation. In this case, considering the size of the scotoma, the macula is fairly efficient. The red scotoma conforms in shape with the white scotoma, but is larger and includes the macula. The blue scotoma is similar to that for white.

In the R.E. there is a relative scotoma to white and blue extending from the blind spot to the 5 degree circle, and a large absolute scotoma for red which passes just below fixation.

The patient was told to stop smoking and given a strychnine mixture. When seen again 6 weeks later (Fig. 6) V.R. 6/6, V.L. - 6/18.

After-images obtained with red, green, and blue.

The scotomata of each eye are much decreased in size.

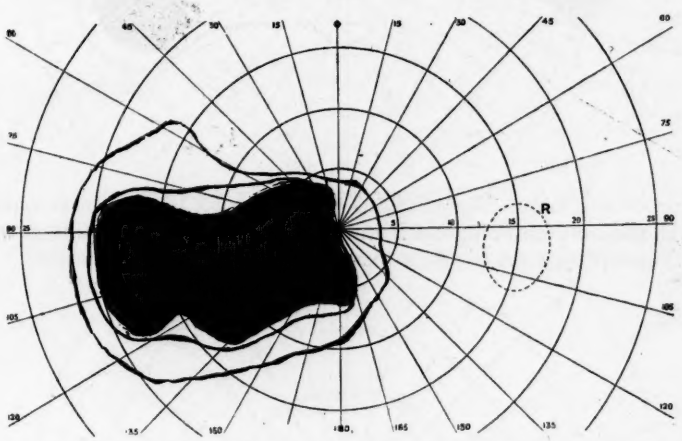


FIG. 4. L.E. The outer line delimits the scotoma for red and the inner one that for blue.

CASE II (Fig. 7 and 8).—J. D. complains that the vision has been failing for 3 months. He smokes 1 oz. of tobacco daily; he is in good work.

V.R. less 6/60, V.L. - 6/18 ptly.; no pallor of discs.

In the R.E. there is an absolute scotoma for white on the 5 degree circle, and a relative area connecting this scotoma with the blind spot, which has a slight projection inwards. Red is not appreciated anywhere in the central zone.

In the L.E. the blind spot is enlarged towards fixation, and a relative area extends up to and involves fixation. The red scotoma corresponds in shape to the white scotoma.

The patient was told to stop smoking and was given a strychnine mixture.

Seen again 2 months later (Fig. 9 and 10) V.R. 6/18, V.L. 6/6. In the R.E. there is now a very small absolute scotoma on the 5 degree circle, and it is possible to chart a red scotoma. In the

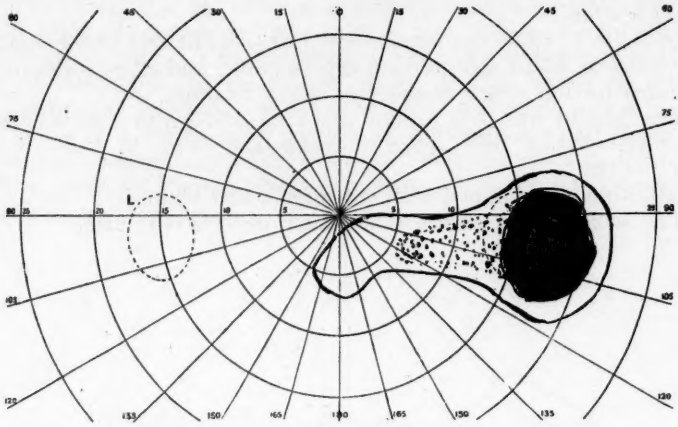


FIG. 5. R.E. The outer line delimits the scotoma for red.

L.E. the only pathological feature is the red scotoma which shows a finger projection towards fixation.

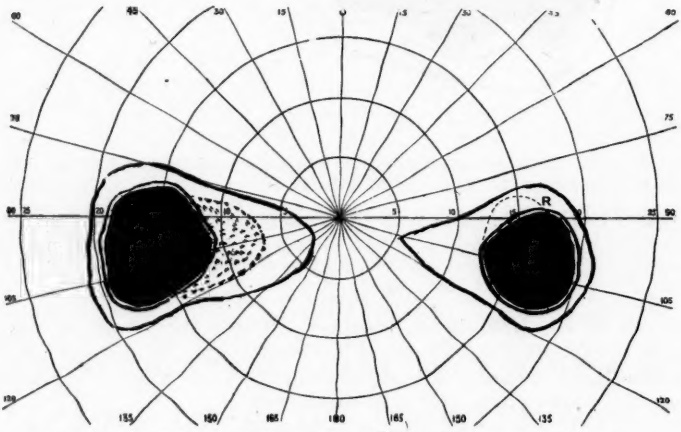


FIG. 6. R. & L.E. The outer line delimits the scotomata for red.

CASE III (Fig. 2).—This is a good example of the recovery stage of the disease. The patient has been under treatment for some months. When seen the vision in each eye was 6/12. In

this case both eyes seem to be affected to an exactly equal degree. In my experience this is unusual. Both eyes show a small

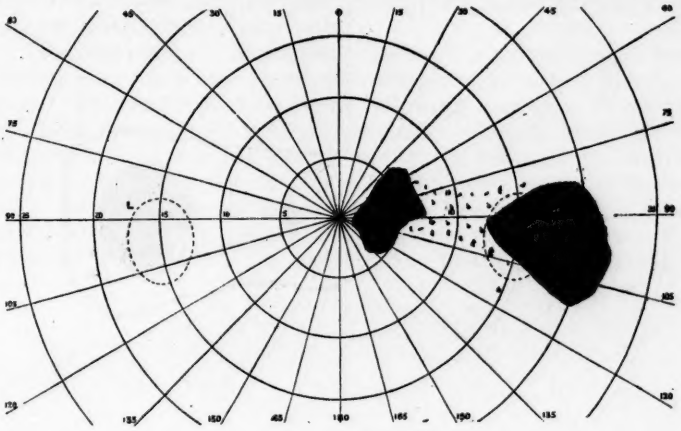


FIG. 7. R.E.

scotomatous finger for white extending from the blind spot towards fixation and a red scotoma of larger size but of similar shape.

Comparing now the scotomata seen in early glaucoma with

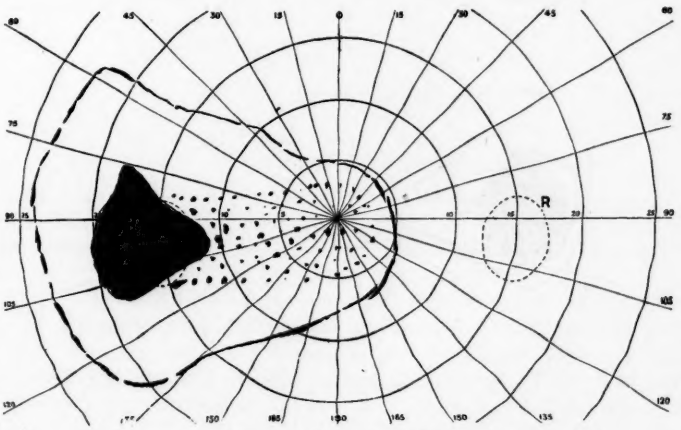


FIG. 8. L.E. The outer line delimits the scotoma for red.

those in tobacco amblyopia, in glaucoma it is rather along the 10 degree and 15 degree circles, or from the upper and lower borders of the blind spot that the earliest scotomata are found; whereas

in tobacco amblyopia it is the area between the blind spot and fixation which is primarily involved.

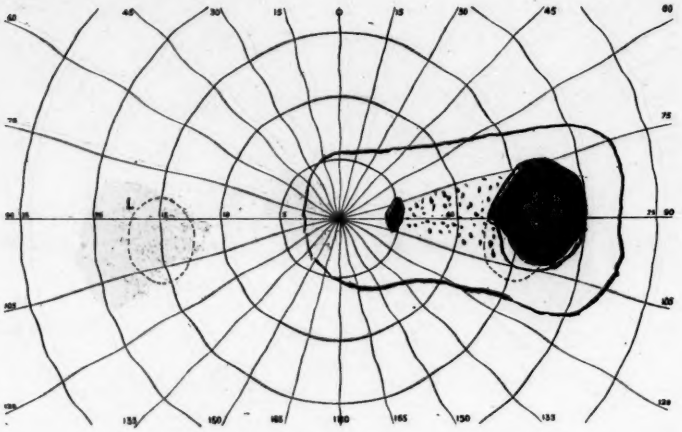


FIG. 9. R.E. The outer line delimits the scotoma for red.

In dealing with tobacco amblyopia certain further points are worthy of notice. Amongst the cases under my observation there were 12 which I was able to follow more or less consistently for

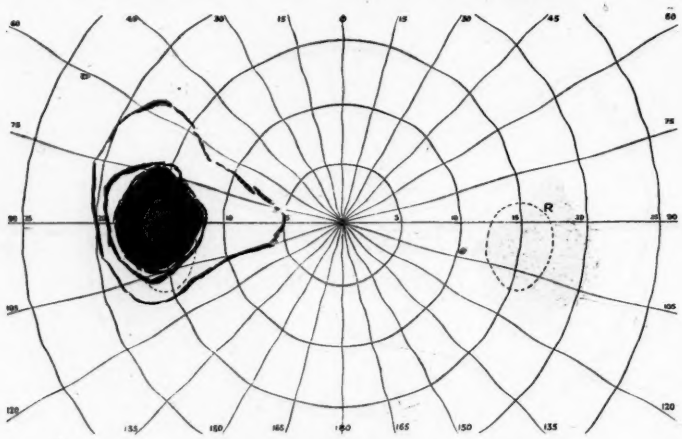


FIG. 10. L.E. The outer line delimits the scotoma for red.

6 months, and the following figures are derived from them. All the 12 were pipe smokers, and 5 are definitely noted as smoking shag tobacco. The amount of tobacco consumed varied from 1½

to 6 oz. a week. Three of the 12 were out of work. In 4 cases pallor of the temporal portion of the optic discs was noted. With regard to alcohol, the highest consumption admitted was 6 pints of beer a day, in one case only.

As a final point: in all the later cases of tobacco amblyopia which I have observed I have taken their after-images to red, green, and blue. This has been done in the following manner. The patient has been told to hold a large clear piece of white blotting-paper in front of him at arm's length, and on the centre of the blotting-paper a red card is placed. He is told to gaze steadily at this card while he slowly counts up to ninety. The card is then hastily snatched away—the patient having been previously warned to keep his gaze fixed on the centre of the blotting paper where the

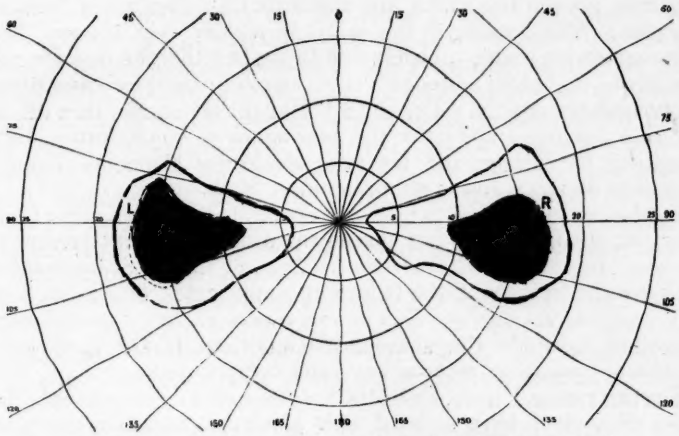


FIG. 11. R. & L.E. The outer line delimits the scotoma for red.

card lay—and the patient asked if he notices any difference in the centre of the blotting-paper at the place where the red card lay. The same process is then repeated with a green card and a blue card.

This method is, of course, very unscientific, as it takes no heed of the phenomenon of successive induction as affecting the green and the blue exposures. However, the results are fairly constant. Tobacco patients will see the yellow after-image of the blue card, but, except in mild cases, will not appreciate the after-image of the red or green card. They will often say, after the red card has been removed, that its site looks rather brighter than the surrounding area, and, after the green exposure, rather darker than the surrounding area. At times the green-blue after-image of the red is perceived, but not the purple after-image of the green.

ANATOMICAL EXAMINATION OF SIX NEW CASES OF SUBCONJUNCTIVAL FISTULA SCARS FROM FIVE MONTHS TO SIX YEARS AFTER SUCCESSFUL IRIDENCLEISIS OR LIMBAL SCLERECTOMIES IN CHRONIC GLAUCOMA*

BY

S. HOLTH

CHRISTIANIA

MOST microscopical examinations after iridencleisis, and especially after sclerectomies, are made on eyes of animals, mostly rabbits. The sclerectomy opening is here, without any exception, closed by a firm scar tissue; this is also the case with the human eyes with glaucoma absolutum which are enucleated for increase of tension and pain. The opening in the sclera in rabbits' eyes is soon filled with connective tissue, probably due to the fact that the new-formed aqueous in the rabbit contains a large amount of albumen and fibrin and coagulates rapidly. Dr. Sigurd Hagen has shown that this is not true for man, and that the new aqueous which forms after operations for cataract and for primary chronic glaucoma contains very little albumen and is quite devoid of fibrin.

In glaucomatous eyes which are enucleated as the result of late infection, the infiltration has effaced the usual conditions present in the scar after successful operations. It is, of course, of importance to know the reason of the failure in some cases of the modern glaucoma operations; it seems to me, however, that it is still more important to study the anatomical conditions of the scars after successful operations without any later complications.

For this reason I have, since 1905, systematically enucleated after death eyes which have suffered from glaucoma, several years after successful iridencleisis or sclerectomies. As a rule I have obtained permission to hold post mortem examination on promising that the appearance of the face shall not suffer by the examination. This I have obtained by using rabbit eyes preserved in formol as prothesis, a proceeding I can recommend to pathological institutes as well as to colleagues when a post mortem microscopical examination of an interesting human eye is wanted.

At a demonstration before the Ophthalmologische Gesellschaft in Heidelberg in 1913 (*Bericht*, p. 355-370), I pointed out that after iridencleisis, as well as after sclerectomies, a real fistula through the limbal sclera is seen several years after the operation, if successful. I did not then give any details about the appearance of the conjunctival connective tissue covering the fistula, as pointed out by

*Read at the fifth Scandinavian Ophthalmological Congress at Stockholm, August 29, 1921.

K. G. Ploman in his able treatise on " Sclerectomy in Glaucoma," of 1915; but I did so in a paper called " The Condition of Conjunctiva in Fistulous Scars after Iridencleisis and Sclerectomies," given September 25 at the Ophthalmological Society in Christiania, where I demonstrated several preparations.

I will now project some micro-photographs, which have not hitherto been published, of subconjunctival fistulous scars examined from five months to six years after successful iridencleisis, and also after successful trephine and punch forceps sclerectomies. Fig. 7 is photographed from a section stained with haematoxylin-eosin, the others are photographed from sections stained with haematoxylin and van Gieson. The photographs are made by Prosector O. Berner, M.D.

The conjunctiva bulbi has in all the preparations normal and unimpaired epithelium; in the more or less cushion-like part, covering the field of operation, the conjunctival connective tissue is seen to have the fibres somewhat closer together and to be somewhat richer in cells than normally, especially towards the episclera from which the conjunctiva was loosened with the keratome or scissors in the early stages of the operations. No cells show degenerative changes, all are strongly staining. In the sections stained with haematoxylin and van Gieson the intercellular connective tissue of conjunctiva shows in some places a somewhat more diffuse slightly yellowish red colour, but in none of the preparations are seen signs of hyaline degeneration.

The special microscopical conditions of the preparations will be described separately below each picture. In this description I have enjoyed the valuable help of F. G. Gade, M.D. At the same time I will give a short summary of the account of the clinical conditions in each eye.

1. N. F., late teacher, aged 65, of Christiania, January 8, 1900; complains that the sight of right eye has constantly been decreasing in the course of the last two years. Both eyes feel hard; the discs were pale with excavation to the edges upwards and outwards. R.E.: T. + 2, V.c̄+4.5 = 5/10. Great reduction of both nasal visual fields and a curved Bjerrum scotoma close below the fixation point outwards to the blind spot. L. E.: T. +1, V.c̄+5.0=5/8; a small sector was absent from the field of vision on the nasal side horizontally about 25° from the fixation point, but otherwise the field was full. The reduction of the visual fields constantly increased in spite of constant use of miotics. Iridectomy of the right eye was done on January 30, 1901 and a similar operation on the left eye on February 6. But there was a constant aggravation and the tension did not decrease in spite of reassumption of miotics. November 7, 1905, R.E.: doubtful counting of fingers half a metre away, with a remnant of the visual field temporally to the blind spot;

T. 10/3 Schiötz (51 mm. Hg.). L.E.: V.=5/60; visual field shows nasal reduction to 8° from the fixation point and curved Bjerrum scotoma above as well as below to the blind spot. T. 10/4 (46 mm. Hg.).

November 10, 1905: *Iridencleisis simplex* R.E.

November 13, 1905: *Iridencleisis simplex* L.E.

In both cases a fold of iris at the periphery of the temporal coloboma was drawn out through the angle of the subconjunctival keratome incision. A somewhat raised and soft cushion developed over the scars with surrounding oedema which increased by

FIG. 1.

N. F., died January 13, 1910, aged 75. L.E.: Axial vertical section (magnified 18/1) through subconjunctival iris fistula after *iridencleisis simplex* on November 13, 1905, at the coloboma periphery in an eye operated by iridectomy four years and a half earlier. The conjunctiva near limbus was raised into a cushion which pits on pressure and is without any thin bubble. The surrounding oedematous area was increased by massage. The fistulous track is lined with pigment epithelium throughout the oblique subconjunctival keratome incision and ends in a cyst, also formed by iris tissue, outside sclera. The inner wall of the cyst is only partly lined with pigment epithelium, but in the surrounding conjunctival connective tissue, in some places, a few scattered pigment cells occur and, in higher magnification, some loose pigment granules may be seen.

massage; there was no thin bubble. The tension ever since has been tonometrically normal in both eyes without miotics. December 18, 1907: R.E.: V. = counts fingers at one metre; a small island of central visual field seems to be re-established. L.E.: V. = 5/24; visual field unchanged. Both eyes: T. 5.5/4 (21 mm. Hg.). For the years 1908 and 1909 I have no notes, but the patient's sister believed that the sight of the left eye remained

unchanged till the death, January 13, 1910. Eyes enucleated 38 hours after death. The subconjunctival iris fistula of left eye is shown in Fig. 1.

2. Mr. X., aged 69 years 4 months, Nordland. February 17, 1908: R.E. blind for two years. L.E.: the sight failing during the last year in spite of constant use of miotics. V. = 5/36. Visual field: upwards 45°, temporally 55°, downwards 28°, nasally 12°; curved Bjerrum scotomata both over and under the fixation point outwards to the blind spot. Tension of both eyes 5.5/3 (25 mm. Hg.); in similar cases I have proved that the tension is higher in other hours of the day than in the oculists' consulting hours. After treatment of lacrymal obstruction on the left side and of chronic conjunctivitis in both eyes I performed on March 11: ***Iridencleisis cum iridotomia meridionali*** on the right eye and on March 15 the

FIG. 2.

Mr. X., died August 16, 1908, aged 69 years 9 months. Axial vertical section (magnified 15/1) through subconjunctival iris fistula in the left eye after *iridencleisis cum iridotomia meridionali* upwards, on March 15, 1908. The iris fistula lined with pigment epithelium and somewhat narrow on account of collapse after death is continued for a while episclerally and ends in a fissure in the subconjunctival tissue which contains some pigment granules. By comparing a number of serial sections this fissure is seen to communicate with Tenon's capsule. The conjunctiva over the iris fistula is a little thickened.

same operation on the left eye. March 26: L.E.: V= 5/18; visual field somewhat enlarged. Both eyes: T. 15.5 mm. Hg. August 11, 1908: consulted a colleague for abdominal complaint who diagnosed cancer of the pylorus. August 14: L.E.: V = 5/18; visual field upwards 50°, temporally 80°, downwards 65°, nasally 44°; the lower Bjerrum scotoma has disappeared, the upper scotoma reaches now from the blind spot to the vertical meridian. *No conjunctival oedema over the flat scar;* T. 18 mm. Hg. By light massage of the globe no conjunctival oedema was produced, but the tension was thereby lowered to 15.5 mm. Hg.

R.E.: T. 18 mm. Hg. and by light massage 15.5 mm. Hg.; here was seen a thin bubble over the scar and diffuse conjunctival oedema. August 16 the patient died suddenly (heart failure). Eyes enucleated August 18, the bulbar conjunctiva being incised at equator. By microscopical examination of both eyes there was seen a well-developed iris fistula through the scleral incision. In the right eye the fistula ends in a little cyst in the oedematous conjunctiva. In the left eye (Fig. 2), the fistula continues for a

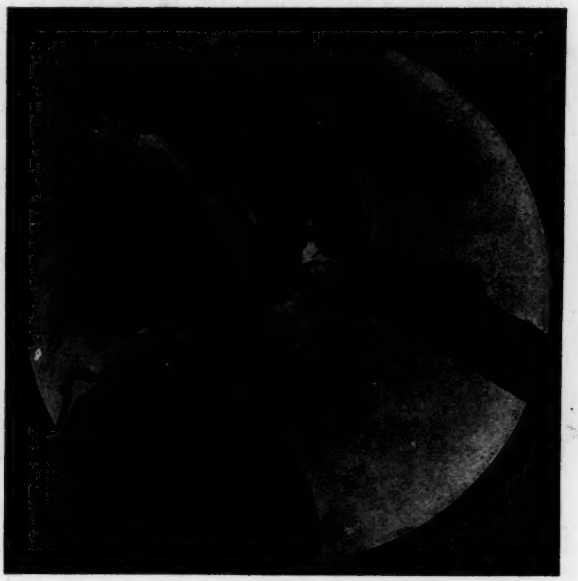


FIG. 3.

G. H., died March 12, 1914, aged 72. Left eye. Axial vertical section (magnified 18/1) through a subconjunctival iris fistula after *iridencleisis cum iridotomia meridionali* upwards, April 4, 1908. Conjunctiva over the encleisis forms a flat and soft cushion without any bubble but with surrounding oedema which increased by massage. The fistula lined with pigment epithelium is enlarged upwards, outside the keratome incision, to a small funnel-shaped space, the walls of which are only partly lined with pigment epithelium. The funnel sends a prolongation backwards into the episcleral tissue. Some few pigment cells, and a few loose pigment granules, are seen in the connective tissue of the covering conjunctiva.

while episclerally and ends in a subconjunctival fissure; by comparing a number of serial sections this fissure is seen to communicate with Tenon's capsule.

3. G. H., Ph.D., aged 64, Christiania, February 5, 1908: For a couple of years he has observed, in both eyes, an increasing

reduction of the nasal visual field; with his amateur knowledge of physiology he believed this was due to an incurable brain complaint, and for this reason he had not till now consulted an oculist. Both eyes: discs pale with excavation to the margin; nasal quadrants of the visual field are wanting nearly to the vertical meridian; in the left visual field there is also a Bjerrum scotoma below the point of fixation. R.E.: V.$\bar{c}$+4.5=5/12; T. 7.5/3 (36 mm. Hg.). L.E.:

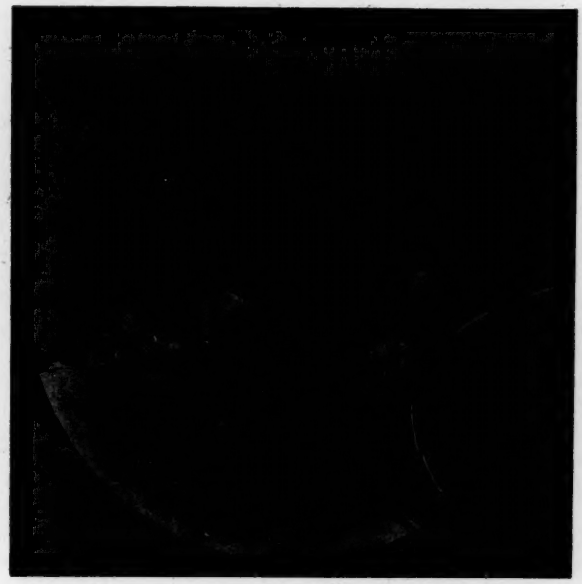


FIG. 4.

G. H., died March 12, 1914, aged 72. R.E.: Axial vertical section (magnified 18/1) through the subconjunctival iris fistula after *iridencleisis cum iridotomia meridionali* upwards, April 9, 1908. Conjunctiva above was somewhat raised into a soft cushion without any thin bubble, but with surrounding oedema which increased by massage. The iris fistula is lined with pigment epithelium; on account of the collapse of the eye after death, the walls of the fistulous track are in contact during the passage through the sclera, but enlarged into a funnel-shaped space in the episclera, the walls of which are partly lined with pigment epithelium. Some scattered pigment cells and pigment granules are seen in the connective tissue of the covering conjunctiva.

V.$\bar{c}$+4.0=5/24; T. 7.5/2 (43 mm. Hg.) Pilocarpin lowered the tension somewhat but not enough.

April 4, 1908: *Iridencleisis cum iridotomia meridionali* in the *left eye.*

April 9, 1908: *Iridencleisis cum iridotomia meridionali* in the

right eye. In each eye over the encleisis a flat conjunctival cushion appeared without any thin bubble, but with surrounding oedema which increased on massage. The tension became at first subnormal, but later normal (18 to 21 mm. Hg.) without miotics, which were not used at all during the remaining six years of his life. The nasal quadrants of the visual fields were considerably re-established, and the temporal ones kept so that the patient could see quite well; the first four summers after the operations he took walking excursions alone in the Jotunheimen and photographed mountain panoramas. When I saw him last on September 19, 1912, I found R.E.: V. $\bar{c}$ 4.5 still = 5/12 and L.E.: V. =.5/18 (somewhat better than before the operation). March 12, 1914, he died of complications of prostatic enlargement. His landlady told me that he had read books up to the last. Both eyes were enucleated 38 hours after death; the subconjunctival iris fistulae are shown in Fig. 3 (left eye), and Fig. 4 (right eye).

4. E. N., aged 54, female teacher, Christiania, December 18, 1911. Sight of left eye blurred for several months; she has not had pain and has not perceived any coloured rings round the light. L.E. is not injected, but the surface of the cornea is hazy, the pupil is enlarged (6 mm.) and reacts slowly to light. The disc shows a shallow excavation to the margin but is not pale. V. $\bar{c}$ correction = 5/15. The visual field is reduced 20° in the two temporal quadrants and somewhat more in the two nasal ones. T. 15/5 (61 mm. Hg). R.E.: the pupil on an average 4 mm. reacts well. Fundus normal. V. $\bar{c}$ correction = 5/5. Visual field nearly normal, 10° at most, contraction in the nasal quadrants. T. 7.5/3 (36 mm. Hg). She would not at first hear of any operation: eserin 0.5 per cent. four times a day in the left eye, pilocarpin 2 per cent. twice a day in the right eye was prescribed. January 8, 1912: Tension of the left eye is very little improved (10/3 51 mm. Hg)., the tension of the right eye unchanged in spite of the use of miotics.

January 9, 1912. L.E.: *Trephine operation* upwards with a trephine of *2 mm. without splitting of the cornea* as there was plenty of room to get into the anterior chamber; basal iridectomy was performed.

January 17, 1912. R.E.: *Limbal sclerectomy* upwards of the anterior lip of the wound with a 3 mm. wide Holth's *punch forceps*; scleral excision 1.5 × 3 mm.. basal iridectomy.

In both eyes appeared a glassy conjunctival cushion upwards and a thin glassy bubble, through which the sclerectomy defect was seen as a black opening, at first original size, later smaller (see the texts under the pictures Fig. 5 and Fig. 7); round the cushions appeared a diffuse oedema which increased by massage. Tension at first subnormal, later normal. The visual field became quite normal in right

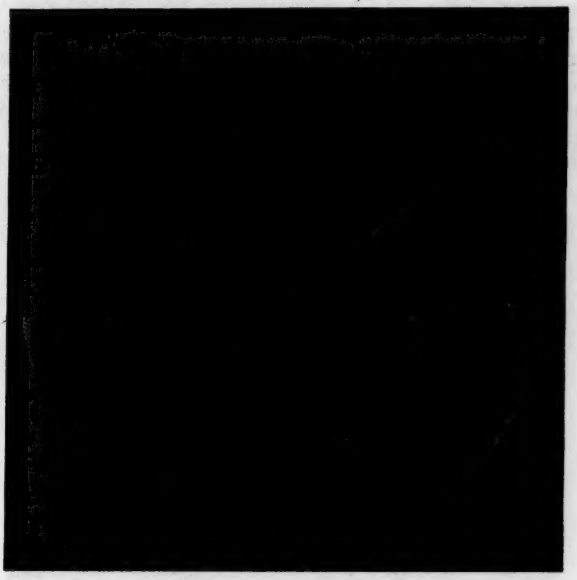


FIG. 5.

E. N., died May 6, 1915, aged 57¾. L.E. : Axial vertical section (magnified 18/1) through the centre of the *limbal sclerectomy* defect upwards after a 2 *mm. trephining* made January 9, 1912; no splitting of cornea; basal iridectomy. A glassy conjunctival cushion was developed with a thin glassy bubble above limbus; through the bubble the scleral defect was for a long time seen as a black round hole of 2 mm. in diameter, but the black hole after a time became smaller and on January 30, 1915, it appeared as a 0·75 mm. wide black opening in the middle of a grey field corresponding to the original trephining. The conjunctiva with normal epithelium passes over the defect, but in the deeper subconjunctival layers it is condensed as shown in the photograph by the part staining deeply which by magnifying 135/1 is seen to consist of a denser connective tissue, somewhat rich in cells, with fibres running chiefly in meridional direction; near the anterior edge of the light opening the fibres in the deeply stained area run in a circular manner In the anterior (corneal) wall of the scleral defect the denser connective tissue originates exclusively from the subconjunctiva; in the posterior (ciliary) wall of the defect, the condensed tissue consists of two layers, the uppermost one proceeding from subconjunctiva, the deeper one proceeding from the scleral wall itself; on the border between the two layers are seen episcleral vessels. In the middle of the darkly staining tissue which I have called " the subconjunctival cicatricial covering " is seen a spongy connective tissue with extremely fine largely meshed fibres and with very few scattered cells. This tissue is continued upwards towards the surface even under the normal epithelium. In the circumference of the light part this tissue gradually changes into a denser tissue which is more rich in cells. The anterior (corneal) wall of the defect is lined with a thin layer of dense connective tissue with vertically running fibres and with endothelium from Descemet's Membrane; this endothelium is not seen elsewhere on the walls of the defect.

eye and nearly normal in left eye where V. rose from 5/15 to 5/7.5. Last note January 30, 1915. R.E.: V. c̄ correction 5/4; T. 5.5/5 (18 mm. Hg.). L.E.: V. c̄ correction = 5/7.5; T. 5.5/3 (25 mm. Hg.); pilocarpin 2 per cent. was now ordered for the left eye, twice a day. May 6, 1915, she died suddenly (*apoplexia pontis Varolii*). Both eyes were enucleated 43 hours after death. The subconjunctival sclerectomy fistulae are shown in Fig. 5 and Fig. 6 (left eye) and Fig. 7 (right eye).

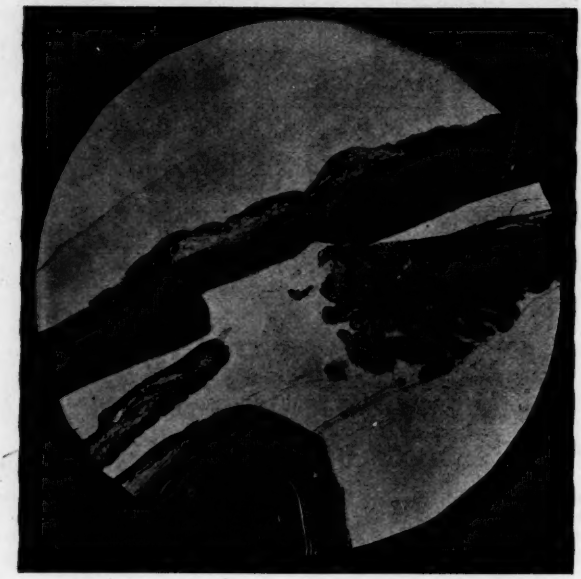


FIG. 6.

Axial vertical section 0.5 mm. temporally to the section photographed in Fig. 5. In Fig. 6 the dense darkly-stained subconjunctival cicatricial tissue covers the scleral defect completely.

The light area in the centre of the dark in Fig. 5 and the corresponding two light areas in Fig. 7 may be explained in a similar way as I explained five years ago such a light area in Fig. 8 in *Heidelberger Bericht*, 1913, p. 365; that the aqueous has forced its way through the cicatricial roof of the scleral defect and made a secondary fistula in the subconjunctival tissue communicating with the original one in the sclera. Such a breaking through might be expected to take place during the first weeks after the operation while the subconjunctival scar tissue is still soft and succulent. As far as the

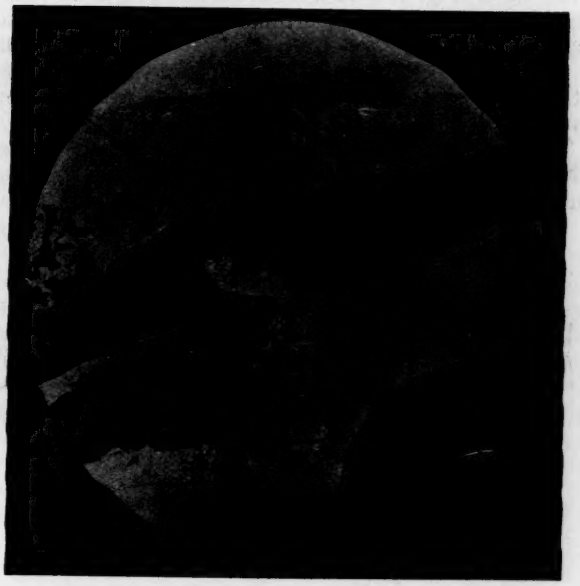
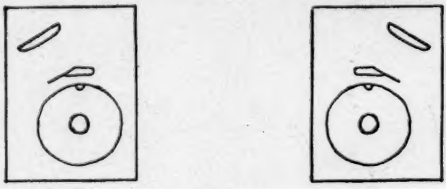


FIG. 7.

E. N., died May 6, 1915, aged 57½. R.E.: Axial vertical section (magnified 18/1) through a subconjunctival scleral defect upwards after a *limbal sclerectomy*, on January 17, 1912, *1.5 × 3 mm.* large, of anterior wound lip with Holth's *punch forceps*, 3 mm. wide; basal iridectomy. A glassy conjunctival cushion was developed, with a thin glassy bubble over limbus. The sclerectomy defect was first seen through the bubble as a black opening in its original size, which after a time somewhat decreased and was divided in the middle into two halves by a nearly meridional, and slightly oblique grey string in the depth of the opening. The photograph shows a defect in the sclera with the posterior (ciliary) wall sloping upwards and backwards, the anterior (corneal) wall on the other hand is steep and has rounded edges. The defect in the sclera is everywhere covered with the conjunctiva whose epithelium is normal; the conjunctival connective tissue is somewhat denser and richer in cells than elsewhere away from the operation field. The anterior (corneal) wall of the defect is lined with a layer of connective tissue the fibres of which run in a vertical direction to the course of the sclero-corneal fibres. This layer of connective tissue is lined with endothelium from Descemet's Membrane, but the endothelium does not continue on the under surface of the conjunctival covering of the defect in the sclera or on the posterior (ciliary) wall where the *scleral fibres end quite free without any sign of a reactive process.* In the darkly stained connective tissue of the conjunctiva over the scleral defect there are seen two lightly staining areas which by magnifying 135/1 proves to consist of a spongy connective tissue with extremely fine largely meshed fibres and with very few scattered cells. One of these lightly staining areas is seen near the limbal insertion of the conjunctiva, reaches close under the epithelium, but is in the section shown above interrupted by a denser bridge of connective tissue which appears dark in the photograph and corresponds to the oblique grey string across the scleral defect which was visible through the thin glassy bubble. The second lightly staining area is seen in the posterior part of the conjunctival covering of the scleral defect, but this area is separated from the epithelium by means of denser connective tissue.

two actual scars (Fig. 5 and Fig. 7) are concerned, however, I do not believe this explanation will do, especially not in the case of the trephining fistula. My observation given in the text under the picture Fig. 5, about the gradual shrinking of the trephining defect from the periphery, as seen through the thin glassy conjunctival bubble, makes it likely that the process has been different in this case. The subconjunctival scar tissue has been slowly developed from the edge of the trephine opening at the expense of the lightly staining connective tissue which from the beginning covered the whole of the opening. If the patient had lived longer the fine spongy tissue might entirely have been transformed into denser connective tissue and the opening completely closed; I have clinically seen instances of such cases. I wish to draw attention to the fact that a scleral tissue has been developed from the posterior (ciliary) wall of the scleral defect after the trephining (Fig. 5), while



A FIG. 8. B

Showing the subconjunctival tunnel in the right and left eye—somewhat outside the upper vertical meridian—for tangential and extralimbal punch forceps sclerectomy 1×3 mm.

this wall does not at all show any reaction after the clean cut keratome incision for sclerectomy with punch forceps from the anterior wound lip (Fig. 7).

I believe that the preparations from which the photographs Fig. 5 and Fig. 7 are taken very well explain the phenomenon discovered by Dr. Erich Seidel by means of a fluorescein test on the scar after many cases of sclerocorneal trephining; the aqueous oozes out on the surface of the eye from the thin conjunctival bubble; this bubble at first becomes green by fluorescein, then the oozing aqueous in a slow stream following the law of gravitation washes the green colour away. The quantity of the oozing aqueous was measured by a special test—in one case it was 2 milligrammes per minute (*Arch. f. Ophthal.*, 1920, Vol. CII, p. 371, and Vol. CIV, p. 158).

I have no doubt that this phenomenon might have been found in both eyes with my patient, E. N., from which Fig. 5 and Fig. 7 are taken. If this had been the case the way of the aqueous must have been through the scleral defect and through the opening in the denser subconjunctival cicatricial tissue into the light spongy tissue

reaching to the apparently normal epithelium, by enlargement 135/1. For this reason the aqueous must be supposed to have oozed out through the intercellular spaces of the epithelium; in his cases Dr. Seidel could not, under Gullstrand lamp and corneal microscope, see any epithelial defect in the conjunctival bubble.

The cause of the oozing must be that the denser connective tissue surrounding the bubble forms an obstacle to the subconjunctival passage of the aqueous. In spite of a normal tension being obtained by this oozing of the aqueous, I consider this condition undesirable because it affords *an easy way to late infection.*

Dr. Harald Gjessing who first drew my attention to Seidel's fluorescein test in trephining scars, after successful iridencleisis, has till now found the test positive in one case only where a thin conjunctival bubble had appeared; in cases with a cushion without any bubble but with surrounding diffuse oedema or with the latter condition only, neither Gjessing nor myself can find Seidel's phenomenon. This statement applies also to the cases I have examined after successful tangential extralimbal sclerectomy with

FIG. 9.

Holth's double blunt hook for pulling the conjunctiva towards the limbus after the subconjunctival tunnel incision. Made by John Weiss & Son, Ltd., 287, Oxford Street, London, W. (Catalogue 117).

punch forceps; in one case, operated November 18, 1920, with a 1.5 mm. broad punch forceps where, half a year after the operation, was seen a conjunctival cushion with a bubble* more than 1 mm. from the limbus the fluorescein test was also negative probably because the bubble had thicker walls than the epithelium.

As the appearance of the thin conjunctival bubble must be supposed to depend on cicatricial obstacles to the subconjunctival passage of the aqueous, I believe that the quantity of subconjunctival cicatricial tissue should be reduced as much as advisable in the modern operations for glaucoma. For this purpose, I believe that the length of the incision for the conjunctival flap in the tangential punch forceps sclerectomy (this journal, 1921, p. 547, Fig. 5) may be somewhat reduced; or the subconjunctival tunnel may be made as in most of my iridencleisis operations and in several sclerectomies (*Annales d'Oculistique*, 1909, Vol. CXLII, p. 1, Fig. 11 and Fig. 12).

The diagram Fig. 8 shows the tangential extralimbal sclerectomy with punch forceps through a subconjunctival tunnel.

*After tangential extralimbal sclerectomy with the 1 mm. broad punch forceps I have till now seen a cushion and oedema only and not any bubble.

The bulbar conjunctiva must be undermined to limbus and lifted with forceps while the scleral excision is made; during the iridectomy (basal as in Fig. 8, or complete) an assistant must draw the conjunctival incision down to the sclerectomy defect by means of a U-shaped blunt double hook (Fig. 9).

The small conjunctival incision ought to be closed by a suture: first half of the surgical knot; the suture is removed after 48 hours. In performing the different subconjunctival operations for glaucoma, the blades of the speculum ought to be short in transverse direction; by this means the palpebral fissure is well opened vertically, and thus plenty of space is obtained for the formation of the conjunctival flap or the subconjunctival tunnel.

The subconjunctival tunnel may be made with the keratome itself and completed to the limbus with scissors, or made with scissors only before the keratome incision. Dr. E. Lindgren makes only the short conjunctival incision with scissors; he makes the tunnel itself by a blunt detachment of the conjunctiva down to limbus, *e.g.*, with closed scissors. By this proceeding the vessels are probably less hurt, which must be considered an advantage. Elschnig (*Arch. f. Ophthal.*, 1921, Vol. CV, p. 599) has shown that the conjunctival cover of the trephine aperture is devoid of vessels. Elschnig also believes that the aqueous has tissue-dissolving qualities, which, in his opinion, is proved by the fact that a loose scleral disc fallen into the anterior chamber during trephining, as a rule has completely disappeared in a relatively short time. The best possible vascularisation of the covering conjunctiva may counteract this hypothetical dissolving quality of the aqueous.

[Dr. HOLTH writes that the title of his paper in the last number of this Journal should have been: "A New Technic in Punch Forceps Sclerectomy for Chronic Glaucoma: Tangential and Extralimbal.—Iridencleisis Operations resumed 1915-1919."—ED.]

THE IMPORTANCE OF PSYCHICAL INHIBITION (NEUTRALIZATION) IN BINOCULAR SINGLE VISION

BY

DR. EMIL BERGER

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DR. JAVAL, of Paris, has published evidence of the existence of neutralization of part of the retinal image of a squinting eye in order to avoid diplopia. It has also been shown that diplopia is common in the early stage of the development of a squint. This diplopia is caused by the projection of the retinal images of an object to non-corresponding parts of the two retinae. In another series of experiments Javal has shown that diplopia does not occur even when the sizes of the two retinal images are very different. This question had been discussed in former times and was con-

sidered to be a neutralization phenomenon. This explanation is not correct, and reference should be made to the experiments of Helmholtz, Hering and Parinaud.*

The following experiment shows that the neutralization of Javal is a *psychical inhibition* of one part of the retinal image of one eye made in the interest of the exact recognition of objects. If we hold a finger before one eye, after a few moments the finger seems to become transparent and objects can be seen through it. Previous observers of this phenomenon have failed to give a satisfactory explanation of it. If, however, we carry the observation a little further we get a clue to the correct explanation. If we observe, for example, a tree through the apparently transparent finger and then raise the finger so that it partly covers the sky the part of the finger covering the sky no longer appears transparent, but only the part that covers the tree. Similarly, if we observe a sketch on white paper the finger will appear transparent only on those parts of the sketch that delineate the object. We may, therefore, draw the conclusion from these experiments that the apparent transparency of the finger is due to *psychical suppression (inhibition) of one part of the retina of one eye so as to facilitate the recognition of the contours of objects.*

In this connection it is of interest to recall the discussion by Panum and Helmholtz on the relative importance of shadows and contours in the psychical recognition of objects. The contours are undoubtedly the more important.

The phenomena of psychical inhibition in the interests of binocular single vision can also be demonstrated by the aid of the stereoscopic cards for the determination of the central vision of amblyopic eyes devised by me and shown in 1910 by Dr. Weiss, Professor of Biological Physics at the University of Paris to the Paris Academy of Medicine. With these cards the fixation of the sound eye is directed by a black cross, while the defective eye is directed to a black spot of different sizes in the different cards. With normal eyes the cross is seen inside the black spot, but surrounded by a lighter area in the black background. This phenomenon is to be explained on the assumption that part of the retinal image of the eye which sees the spot is suppressed to enable the image of the cross to be clearly recognised. If we further elaborate the experiment by introducing a sketch containing fine contour lines into one part of the cross, then that part of the black spot which surrounds this area of the cross will appear much lighter than the rest.

The same explanation elucidates a stereoscopic experiment which has not been previously understood. If we draw in a

* "Leçons d'Optique Physiologique." M. Tscherning.

stereoscopic card on the right side a black vertical ray and on the left side a black horizontal ray, the stereoscopic fusion of both rays produces a black central square and we see the black ends of both rays, but the parts between the rays, which are joined to the central black square, are much lighter. The explanation is the following. For the recognition of the contours of the left ray the brain produces a suppression of two parts of the right ray, and the same phenomenon occurs for the recognition of the contours of the right ray.

Some, but not all, observers, on looking at a landscape with a red glass before one eye and a blue one before the other, see the lighter portions red and the darker ones blue. To some persons red appears as a light colour and blue as a dark one. To such observers the brain produces inhibition of the dark parts of the retinal image in one eye and of the light parts in the other.

In the use of the microscope, if the unemployed eye is kept open, as is usually recommended, the image of that eye is suppressed by psychical inhibition. *This psychical inhibition is not so harmless as it may appear to be;* for it has been shown that prolonged use of uniocular instruments (microscopes, watchmakers' lenses, etc.) may lead to the suppression of the image of the unemployed eye even when the instrument is not being used. I found great difficulty in the introduction into industrial plants of my binocular magnifiers (demonstrated by Professor Lippman to the Academy of Sciences of Paris, Comptes Rendus, November 23, 1899) on this account as the experts who tested them were often persons who had used uniocular instruments all their lives.

The phenomena of hysterical amblyopia and amaurosis described by Professor Charcot as "Crossed hysterical blindness" are quite analogous to the phenomena of psychical inhibition of the retinal image of one eye in the use of uniocular instruments.

On the assumption that hysteria is a disturbance of function of the cerebral cortex (Charcot) we may conclude that, as a result of the consideration of the phenomena of hysterical uniocular crossed blindness, the higher visual psychical functions (recognition) are localized in the cortex, the right cortical area being associated with the left eye and the left cortical area with the right eye.

It is not possible, at present, to draw any further conclusions on the localization of the higher psychical visual functions.

EYE SYMPTOMS DUE TO OSTEOMYELITIS OF THE SUPERIOR MAXILLA IN INFANTS

BY

DR. E. MARX

LEYDEN (HOLLAND)

THE disease that nowadays is generally called osteomyelitis of the superior maxilla, and was formerly known as acute sinusitis of the antrum Highmori in newly-born infants, sometimes presents a number of symptoms that lead to an oculist being consulted. It is true that this is not a frequent occurrence, for during the past nine years I have only seen three children who were suffering from the above affliction. It is important, however, that the diagnosis be determined in these few cases, and seeing that ophthalmic literature, at least as far as I am aware, ignores this complex of symptoms altogether, I take the liberty of mentioning the histories of these three cases, and adding a few remarks.

A few years ago a child but three weeks old was brought to me with a conjunctivitis, a fistula in the region of the right lacrymal sac and yellowish discharge from the left nostril and the hard palate; this latter, however, I only heard of later, for it was not mentioned to me by the person who came with the child. I misconstrued the symptoms, and imagined that I had to deal with a case of running discharge from the lacrymal sac, although on applying pressure to that sac nothing flowed from the canaliculi, which, as is well known, is not always necessary, provided the fistula discharges sufficiently. It very quickly became apparent that the canaliculi were quite normal, so that the only treatment needed consisted in keeping the eye clean with an eye lotion, which soon cured the inflammation of the membranes, and the fistula, after the osteomyelitis of the maxilla had been stopped by the good services of the surgeon (Dr. Boevé).

With the second child (also a patient of Dr. Boevé) there was a discharge from the mouth, from both maxillae, the upper and lower eyelids were swollen and red on both sides, and there was also some chemosis. In the right lower eyelid a fistula opened and gave off pus containing staphylococci. The left lower eyelid was swollen, as also the region of the lacrymal sac. The conjunctivae of both were red and there was also a slight discharge, whilst here also the canaliculi appeared unobstructed. After a few days a fistula also burst in the left lower eyelid, perfectly symmetrical with that on the other side. I did not see this patient again after the fourth day. All I can add is that the general

condition of the patient was fairly good, so that a complete cure probably ensued.

The third patient I have recently observed in Professor Zaaijer's surgical clinic. The child was admitted owing to a swelling of the palate and the alveolar process, discharge in the mouth and a fistula in the upper lip. It showed a fairly pronounced protrusion of the right eye that could not be measured exactly. The movements of the eye were apparently not reduced, but the veins in the fundus were swollen. The pupils appeared to be equally large and to react well to light. The tension was normal. Two days later the protrusion was less, but now the region of the lacrymal sac and the right lower eyelid appeared to be swollen and fixed, whilst the conjunctiva of the eyelids was swollen also, and showed signs of a slimy discharge containing yellow staphylococci, similar to those that could be cultivated from the pus from the mouth. Here also the canaliculi worked normally. A few days later all eye symptoms had disappeared, though the discharge from the maxilla continued. The child was finally cured.

The three cases here mentioned are examples of an affliction which, as stated, is nowadays mostly called osteomyelitis of the superior maxilla in infants, a disease seldom encountered, but of which about 35 cases are known to literature. In order to bring these under review I have arranged them in tabular form, in which the eye symptoms have been allotted a separate column, as in this case these naturally interest us the most. Going by former reports and from my own experience, I will now try to sketch briefly the aetiology, symptomatology, and the progress of this disease, for which I have consulted principally the excellent monographs of Brown Kelly[1] and François.[2]

After this general sketch, I shall be better able to draw attention to those points which are of special importance to the oculist.

As regards the aetiology, practically all writers are agreed that this osteomyelitis of the superior maxilla, just as that of the long bones, must be attributed to bacterial infection. As to the nature of the bacilli which here show their influence, we know but little, even if it is known from the investigations of Allard and Sicard[3] that in the osteomyelitis of infants pneumococci and streptococci play a much greater rôle than staphylococci, which in patients of more mature age become so important for the osteomyelitis. I must, however, here state that in two of my cases I have found staphylococci, but there the discharge had already been present for some time, so that the original flora may have been dispersed by the staphylococci.

Careful bacteriological investigation in cases that are in their first stage will be very necessary in future, for the table shows that very little attention has been paid to this question.

The point now to be considered is how these bacilli, whichever they may be, can cause the infection of the maxilla; thus from whence they come, and where they enter the maxilla. As to the latter question, one must bear in mind that the female genital passages are the breeding places of many sorts of microbes which may eventually prove injurious to the child. Nevertheless, I find only one clear example[4] of this in the medical literature, in which case, however, it is not stated that the bacteria of the mother (in this case staphylococci and streptococci) and the child were the same. Further, one may regard as of aetiological importance an infection issuing from the glands or nipples of the breasts, in cases of breast-fed infants, for which perhaps the cases of Douglas and Lacasse, as also my third one, plead, where lymphangitis mammae and cracks in the nipple were notified.

These cases, however, were also not sufficiently investigated from a bacteriological point of view. In the third place one must, as in every osteomyelitis, always bear in mind the possibility of blood transmigration. I can, however, find no real example of this in the literary records, and thus one will often be compelled to state that the origin of the bacilli, which causes the inflammation of the superior maxillae of infants, is unknown, at least provided no further importance is attached to the small skin wounds and ecchymoses, as in the cases of Wood and H. Dujardin.

As regards the point at which the bacilli enter the maxilla, neither from the accounts collected in the literature, nor from my own experience (none of which is sufficiently precise) have I been able with any definite degree of certainty to determine this point.

Most of the writers who report on this are of the opinion, however, that the alveolar border is the spot where the bacilli enter, although often the swelling of the front side of the maxilla, with accompanying swelling and redness of the cheek, and various eye symptoms, are the first signs of the inflammation. This supposition that the place of access is in the alveolar process appears to me perfectly feasible, because the mouth offers the best opportunity for the invasion of bacilli. If one adheres to that supposition, then it is improbable that the bacilli enter through the perfectly sound mucous membrane, and one must thus assume small superficial abrasions; and then it is obvious that the alveolar process must be considered the most easily wounded spot in the maxilla.

The small wounds in the mucous membrane may originate in a birth trauma, i.e., owing to a narrow pelvis, or by pressure from the forceps, or by a face delivery where the fingers of the

accoucheur must often go into the mouth. Landwehrmann[5] has, moreover, drawn attention to the fact that in cleansing the mouth small wounds may be inflicted.

Having once settled in the maxilla the bacilli develop further in the spongiosa of the bone, without the antrum Highmori, which at birth is but very small, assisting in the inflammation. It was formerly supposed that this cavity was the point of exit of the inflammation, but Schmiegelow,[6] Lichtwitz,[7] and specially Brown Kelly, have shown that here one has to deal with a real osteomyelitis of the bone. In proof of this conception the writers just mentioned produce anatomical grounds (at birth the antrum is but a few square millimeters in size), as well as clinical ones, whereby, in my opinion, their contention is amply and finally proved. For the rest I will not venture any opinion on this question of surgical anatomy, which I myself have not been able to investigate.

Once the inflammation in the spongiosa has commenced, it goes further, just as in the osteomyelitis of the long bones. A heavy flow of blood to the inflamed parts sets in, followed by a discharge, and finally necrosis and sequestrum formation. If the matter has collected under the periosteum, then this is eaten into and pierced, and the inflammatory products can disperse in various directions.

The phenomena which the children hereby show are mostly fever, lack of appetite, and sometimes disturbances of the bowels. Usually swelling of the eyelids soon appears, often a fistula in the region of the lacrymal sac, inflammation of the conjunctiva and sometimes exophthalmus, in addition to a frequent discharge of matter from the nose, swelling and fistulas of the alveolar process and the palate, falling out of the teeth germs and sequestration. These symptoms appear in the most irregular sequence and combination, and some, as for instance, discharge from the nose and canine fossa, continue for a protracted period.

If the children are sturdy, and treatment is commenced at once, the prognosis is usually good. From the fact that death followed in more than 25 per cent. of the cases, one can deduce that these two conditions to a favourable result are not complied with by a long way.

The number of practically certain cases of osteomyelitis of the superior maxilla that I have been able to collect amounts to 35, a very small number, though one must assume that many more occur than are published. In the column of the bones, compiled according to the frequency with which they were attacked by osteomyelitis, the superior maxilla, at least as far as adults are concerned, stands almost at the bottom. In infants, however,

that bone occupies a much higher position. Why it happens that in very young children such inflammations are more frequent is perhaps apparent from the experiments of Leber, who showed that it is just in the full-blooded, rapidly growing bones that the bacilli attach themselves the most readily, and there develop. One must thus assume that the superior maxilla of infants grows very rapidly, which for the time being, so far as I am aware, is nothing more than a hypothesis.

Having thus sketched the general progress of this affliction, I can now devote myself more particularly to the eye symptoms, in the first place with regard to the number of times these appear.

Of the 35 cases here tabulated, 30 developed eye symptoms, and it is not certain that the remaining 5 did not have them, for, as I stated, the records of these cases are not complete, and one can be almost sure that when, for instance, a swelling of the cheek is recorded, the eyelids also will have been swollen.

As regards the time of the appearance of the eye symptoms, my information is probably not quite exact, because, as is very natural, former writers paid but little attention to this point. In 8 of the records, however, I have cause to think that it was the eye symptoms that attracted the attention of the family or the doctor. This is no small percentage, and therefore an important point for us, because it may happen that the oculist is the first to be consulted, and the further progress of events may therefore depend on his being able to arrive at a correct diagnosis. That this is not always the case is but too apparent in the last column of the table. Of the 35 cases, the results of 7 are not known; in 18 cases the patients were cured, whilst 10 died. This unfavourable record appears to a large extent to be attributable to surgical assistance being called in too late. Medical attention as early as possible improves the prognosis considerably, and therefore it is of the utmost importance that the oculist recognises the disease quickly. Examples where this has not been the case are to be found in one of my own records, and in that of Dujardin.[8] The latter treated a child with red and swollen eyelids and pronounced exophthalmus on the left. As the condition got worse he made an incision in the eye socket, after which much discharge came and the condition quickly improved. The writer says: "A curious thing, matter came from the mouth and nose on the same side," but he does not proceed any further with this phenomenon. In my opinion, this was an osteomyelitis of the superior maxilla with purulent discharge in the eye socket, indeed a most unusual process, and one which I have only seen recorded twice.

The eye symptoms which appear in this osteomyelitis of the superior maxilla can, for simplicity's sake, be divided into those

EYE SYMPTOMS IN OSTEOMYELITIS OF THE SUPERIOR MAXILLA IN INFANTS.

No.	OBSERVER.	AGE.	EYE SYMPTOMS.	OTHER SYMPTOMS.	CAUSE.	BACILLI.	RESULT
1	Rees (Brown Kelly)	2 weeks	Left: swelling lower eyelid, exophthalmus, conjunctivitis, chemosis	Left: swelling of palate and proc. alveolaris, tooth germs removed	—	—	Cured
2	Grandidier (Brown Kelly)	6 weeks	Right: exophthalmus	Right: cheek and palate swollen, premature dentition	—	—	Died
3	Douglas* ...	15 days	Right: conjunctivitis, swollen eyelids, exophthalmus	Right: swollen cheek and palate	Slight inflammation of the mamma	—	Cured
4	van der Wildenberg†	3 days	Left: red spot in region of lacrymal sac, exophthalmus	Left: pus from nostril, fistula in hard palate and fossa canina, pus from mouth and nose, sequestra removed from ethmoid	—	—	?
5	Dujardin ...	10 days	Left: swollen and red eyelids, exophthalmus	Left: pus from nose, pus from mouth	Skin defect, lower eyelid	—	Cured
6	Roepke (Brown Kelly)	2 weeks	Left: exophthalmus	Left: swollen cheek, pus from nose, fistula of the palate, tooth germs and sequestra removed	—	—	Died
7	François ...	a few days	Right: exophthalmus	Right: swollen tongue, palate and proc. alveolaris, tooth germs and sequestra removed	—	—	Died
8	Marx ...	3 weeks	Right: exophthalmus, vessels in funda swollen, swelling in region lacrymal sac, conjunctivitis	Right: swollen palate, fistula in upper lip	Both nipples cracked, infiltr. in right mamma	Staphylococci	Cured
9	Brown Kelly ...	2 weeks	Both sides: eyelids swollen. Left: exophthalmus discharge from eye	Left: pus from nose, swollen cheek, tooth germs and sequestra removed	Heavy vaginal discharge	—	Cured
10	François ...	20 days	Both sides: eyelids swollen. Left: exophthalmus	Left: swelling proc. alveolaris, matter from nostril, tooth germs and sequestra removed	—	—	Cured
11	François ...	5 months	—	Both sides: pus from mouth and nostrils, cheeks swollen, fistula proc. alveolaris, sequestrum and tooth germs removed. Left: fistula by side of nose	—	—	Cured

12	Marx ...	3 weeks	Both sides : eyelids swollen, conjunctivitis, chemosis, fistula in region of lacrymal sac	Both sides : fistulas and swollen palate, tooth germs and sequestra removed	—	Staphylococci	—
13	Bouchut (Brown Kelly)	2 months	Left : conjunctivitis	Left : pus from nose, abscess and fistula proc. alveolaris, tooth germs removed	—	—	Cured
14	Fürst (Brown Kelly)	8 days	Right : purulent conjunctivitis	Right ; pus from nostril and proc. alveolaris, tooth germs removed	—	Gonococci in eye pus. Not in nose pus	Died
15	Rudaux (François) ...	3 weeks	Left : red and swollen eyelids, fistula lower eyelid	Left : matter from nostril, stomatitis, tooth germs and sequestra removed	—	—	?
16	Greidenberg (Brown Kelly)	3 weeks	Left : swelling lower eyelid, fistula in region of lacrymal sac	Left : swollen cheek, tooth germs and sequestra knocked out	—	—	Cured
17	d'Arcy Power	8 weeks	Right : fistula lower eyelid	Right : cheek swollen, pus from proc. alveolaris	Instrumental confinement	—	Died
18	Platt (Brown Kelly)	a few weeks	Right : fistula lower eyelid	Right : swollen side of face, pus from nose, tooth germs and sequestra removed, fistula proc. alveolaris	—	—	Cured
19	Shirlow (Brown Kelly)	9 months	—	Right : swollen cheek, matter from nose	—	—	Cured
20	Cabanes et Peyneaud	8 months	Left : fistula lower eyelid	Left : periostitis of the proc. alveolaris	Erysipelas of face	—	?
21	Roepke (Brown Kelly)	7 months	Left : swollen eyelid	Left : abscess and fistula proc. alveolaris, pus from nose, sequestrum removed	—	—	Cured, with flatten ng of left side face
22	Roure ...	12 weeks	Right : conjunctivitis, fistula lower eyelid, also region of lacrymal sac, swelling temporal above eye	Right : swollen side of face, pus from nose, two fistulas in proc. alveolaris, tooth germ removed	Septic vaginitis	Streptococci & staphylococci	Died
23	Schmiegelow (Brown Kelly)	10 weeks	Right : both eyelids swollen, pus from lacrymal sac	Right : fistula in the fossa canina, swollen palate, tooth germ and sequestrum removed	—	—	Cured
24	Avellis ...	4 weeks	Left : abscess and fistula lower eyelid	Left : pus from nose	—	—	Cured

No.	Observer.	Age.	Eye Symptoms.	Other Symptoms.	Cause.	Bacilli.	Result
25	Wood (François)	3 days	—	Left: swelling and fistula proc. alveolaris, sequestrum removed	Ecchymose of eyelids at birth	—	Died
26	Landwehrmann	3 weeks	Right: lacrymal sac region swollen, abscess and fistula	Right: superior maxilla and proc. alveolaris swollen, pus from nose, fistula fossae caninae, tooth germs and sequestrum removed	—	—	Cured
27	François ...	8 months	—	Left: swelling proc. alveolaris and palate, fistula palate, tooth germs and sequestra removed	—	—	Died
28	François ...	9 months	Right: fistula lower eyelid	Right: fistula proc. alveolaris, tooth germs and sequestra removed	—	—	?
29	François ...	2 months	Right: swollen eyelids	Right: swollen cheek and palate, pus from nose, tooth germs removed	—	—	Died
30	François ...	2 months	Left: swollen and red eyelids	Left: swollen cheek and proc. alveolaris	Mother has lymphangitis and abcess of mamma	—	Cured
31	François ...	3 months	Right: lower eyelid swollen	Right: pus from nose, swelling proc. alveolaris, tooth germ and sequestra removed	—	—	?
32	François ...	21 days	Right: swollen eyelids	Right: swollen cheek and palate, fistula proc. alveolaris, tooth germ removed	—	—	Cured
33	Lacasse (François)	25 days	Right: swelling in region of lacrymal sac	Right: swollen cheek and palate, fistula proc. alveolaris, tooth germs removed	Lymphangitis of the mamma	—	Died
34	Marx ...	2 weeks	Right: conjunctivitis, fistula in region lacrymal sac	Right: swollen palate, fistulae, tooth germ removed, pus from mouth	—	Staphylococci	?
35	Fliess ...	4 weeks	—	— tooth germs and sequestra removed	—	—	?

* Empyema of the antrum in a child 3 weeks old. *Brit. Med. Jl.*, 1898, p. 398.

† *Centralblatt f. Laryng.*, 1906.

of the eyelids, of the conjunctiva, and, of the eye socket. The symptoms in the eyelids, according to Brown Kelly, are those which first attract the attention in the whole process. In the records at my disposal, I have, as already stated, only seen these symptoms mentioned as being the first to appear, in 8 cases, so that on this point no concurrence exists. The appearance of this swelling, owing to the severe inflammation of the maxilla is, however, as collateral oedema, quite easy to understand.

The swelling and redness in the region of the lacrymal sac and the frequent subsequent fistula are symptoms to which I wish to draw attention, because they may easily lead to an incorrect diagnosis. It is amazing, as Brown Kelly says, that an abscess often forms in the lower eyelid, and that pus can exude from the lacrymal sac. François expresses himself more cautiously when writing that the discharge from the fistula in the inner corner of the eye causes one to think of dacryocystitis, but that accompanying symptoms at once lead the diagnosis in another direction. The fistula just at this point is to be explained by the fact that the inflammation often prematurely develops in the ascending branch of the superior maxilla, and the pus collects there, eventually seeking the easiest method of exit, which, in this case leads to the inner corner of the eye. It is very remarkable that in not a single one of the 35 cases mentioned here is any remark made regarding treatment of the lacrymal sac, which, in all these cases, has apparently remained unaffected. In my three cases investigation shows that the canaliculi were really untouched, and it is well to remember this, because one might be too zealous, and, to the patient's detriment, begin an active treatment of the canaliculi if one did not pay proper attention to the other symptoms. I can only advise one to be as conservative as possible, and even in the commencement of abscess formation in the lower eyelid to make no incision in the abscess, as frequently treatment viâ the palate and processus alveolaris will (as in my case) effect a complete cure, whilst an ugly drawn scar with ectropion may result from incision, as appears from the report of Avellis.[9] It is otherwise not surprising that the discharge from the maxilla in infants does not go over to the lacrymal sac, for it is well known that diseases of the lacrymal ducts in adults also depend far more on inflammation of the ethmoid labyrinth than the antrum Highmori.[10] I do not doubt that in an isolated case inflammation of the lacrymal ducts in the disease in question will be present, but going by experience so far obtained that will not be frequent.

The conjunctivitis, like the swelling of the eyelids, must be taken as a sign of collateral oedema. The degree of severity of the

original affection can thereby appear to a certain extent from the chemosis, which I only observed in the first acute period.

Finally, there remains the discussion of the exophthalmus, which was observed in 10 of the 35 cases. In comparison with the former eye symptoms, which were practically regular symptoms of the disease, this appeared too seldom to be regarded as a sure part of the disease. Exophthalmus, however, is a certain accompaniment of inflammation of the ethmoid. Stephenson[11] has reported 10 cases of inflammation of the ethmoid, which all showed exophthalmus to a greater or lesser degree. Among these 10 there was a 14 days' old child who showed this prominence of the eye in a marked degree, whose eyelids were oedematous, and who suffered from a discharge from its nose. After an incision in the eye socket pus appeared and the child was soon cured. Another similar case is mentioned by Harry,[12] which refers to a child of 3 weeks that also came under treatment with severe exophthalmus. Curettage of the anterior ethmoid sinuses caused pus to appear, after which the child soon got better. Thus it appears that the protrusion of the eye is attendant on the inflammation of the ethmoid cells, which apparently is always followed by purulent exudation in the eye socket. This, again, is further explained by the case of van der Wildenberg in my table, in which in a suppurative jaw affection in which exophthalmus was also present, and in which during the treatment ethmoid cells filled with pus, were opened. This report appears to point out that if during an inflammation of the jaw the eye is pressed forward the ethmoid is also affected. In my opinion, children may suffer from genuine jaw inflammations, genuine ethmoid inflammations, and forms comprising both, each of which must be considered if a protrusion of the eye accompanies a maxilla osteomyelitis.

From this short explanation I think it seems quite clear that the jaw discharges in infants have a certain importance for the oculist. It is, therefore, very surprising that in the ophthalmic literature practically nothing is to be found about these affections. I have only come across one reference by Eversbusch (*Die Augenerkrankungen im Kindesalter*). The writer points out the possibility of mistaking the discharge from the lacrymal ducts for outbreaking osteomyelitis of the superior maxilla. Further, I have not been successful in finding other references, which are nevertheless necessary, as our knowledge regarding these inflammatory conditions is in many places insufficient, especially as regards the aetiology, the progress of the disease, and the exophthalmus.

Here also is again a ground for fruitful combination between various specialities.

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MEGALOPHTHALMUS AND MICROPHTHALMUS

BY

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MADRAS

IN the *Transactions* of the Ophthalmological Society of the United Kingdom, 1920, Vol. XL, p. 132 *et seq.*, will be found an interesting communication by Mr. Treacher Collins on megalocornea and microcornea, in which the conditions known as megalocornea, megalophthalmus, hydrophthalmus congenitus, microcornea, nanophthalmia, and microphthalmus are referred to.

As some of these conditions are of great interest and rarity, and as I am not certain as to what class of case Seefelder (quoted by Mr. Collins), includes under the term megalophthalmus, I feel that it is not out of place to publish the following notes.

Buphthalmus (infantile glaucoma, hydrophthalmus congenitus) is comparatively frequent in South India, and although I have come across cases with comparatively good vision and normal tension, with practically symmetrical eyes, I have never seen a case in which there was not considerable deep corneal opacity, very obvious on examination with loupe or microscope. In the beginning of this year a case was met with which did not give the impression of hydrophthalmus congenitus, nor yet did it comply with the conditions which, as stated by Seefelder, distinguish Megalocornea. The case may perhaps be referred to as one of megalophthalmus.

Brief notes are as follows:—

D. S., Mahomedan, aged 45, admitted 22/3/21 for cataract B.E.

Dimness of vision started five years before, and became very bad inside last few years. The L.E. was interfered with by a coucher three years ago.

R.E.V.=H.M. L.E.V.=P.L. T.=N., B.E. (McLean).

R.E. Pterygium nasal side, a few punctate corneal opacities near its head. Cornea very large, uniformly curved, measures 14 mm. vertically, 15 mm. horizontally. Eyeball measures approximately 27 mm. both ways. Pupil round and active, iris tremulous, healthy, of a uniform brown colour. A.C. very deep. Morgagnian cataract, some points of calcareous deposit on the nucleus, spotted capsule, fluid almost absorbed. With corneal microscope the opacities are seen to be in the middle of the substantia propria, the deep layers of the cornea are clear. The opaque fibrous overlap of the sclera appears abnormally drawn out, approximately 2.5 mm. above, somewhat less below.

L.E. As above, except no pterygium; cornea perfectly clear. The lens tremulous and subluxated backwards (suspensory torn below). Capsule considerably more spotted, and more extensive calcareous deposits in the nucleus.

B.E. The globes are symmetrical in size, the curvatures of sclerae and corneae similar.

The man was a fine muscular healthy specimen, intelligent, had learned to read at school, never had any trouble with his eyes, read print at average distance up to the time of developing cataract. There was no thyroid enlargement. Venereal history and signs of disease wanting, Wasserman negative. Urine free from albumen and sugar. Nothing of interest in connection with family history. Curvature of corneae not estimated with keratometer.

29/3/21. Extraction of cataract. R.E. (Madras method.)

The cornea appeared to be thicker on section than average. The nucleus was large (unfortunately not weighed or measured). Post operative course uneventful.

On 5/4/21 R.E.V. with plus 10=5/30, with plus 14=J. 3. Fundus examination showed fine dust like vitreous opacities. No cupping of the disc, fundus seen best with plus 12. Ordered subconjunctival cyanide of mercury injections.

21/4/21. The L.E. was operated on. Prior to making the section, a very fine hollow needle was introduced into the A.C. which was emptied, 0.6 cc. fluid being drawn off. This gives an idea of the size of the A.C. One rarely gets more than 0.3 cc. in an average eye when carrying out this procedure for cultural purposes. The aqueous was slightly albuminous. The chamber was allowed to refill and section made in the ordinary way. Owing to the subluxation the large nucleus had to be wheeled out with the needle. Some thin vitreous adhered to it, but there was

no escape. Post operative progress uneventful. On 29/4/21 the chamber was formed, section smooth, eye quiet.

The fundus showed a large splash of white (old haemorrhage) to nasal side of disc. There was no cupping. Fine vitreous opacities were present.

On 5/5/21 he was discharged.

R.E.V. with a plus 10=5/20. L.E.V. with a plus 10=5/30.

Of six cases of microphthalmus seen in the past year (of which I retained notes), only one could possibly come under the heading microcornea as defined by Mr. Collins. In this case, although the corneae were small (9 mm. vertical diameter), the iris normal on either side, the scleral portions of the globe apparently normal in size, and the eyes symmetrical, one could not exclude all congenital abnormalities as there was cataract. The other five cases all showed either colobomata or irregularities in the size or shape of the globe as a whole, and asymmetry.

ANNOTATIONS

The Teaching and Examination of Medical Students in Ophthalmology

The Report of the Examination Committee of the General Medical Council, considered on November 26, contained the following clause (*Lancet*, December 10, p. 1,238):—

"*Diseases of the Eye, Ear, and Throat. The inspectors in Medicine and Surgery recommended that Candidates' knowledge of these diseases should either be efficiently tested in the final examination, or should produce evidence that they had been sufficiently instructed and tested as to their knowledge of these subjects.*"

It will be remembered that the Council of British Ophthalmologists issued a report on the Teaching and Examination of Medical Students in Ophthalmology in 1919 (this Journal, April, 1919). Annotations on this subject appeared in the Journal in the June, July, August, and October numbers of that year, and in the July number of 1920. The recommendations of the Council of British Ophthalmologists were as follows:—

1.) *No student shall be admitted to the final examination, qualifying to practise medicine, unless he has attended an ophthalmic clinic for not less than six hours a week during a period*

of three months, and has attended a course of systematic instruction in ophthalmology.

(2.) *No student shall be considered to have passed the qualifying examination unless he has shown a sound knowledge of practical ophthalmology in an examination conducted by ophthalmic surgeons.*

The General Medical Council considered this Report and recommended "that every student should be required to attend a course of practical instruction in ophthalmology of not less than ten weeks' duration, and that no student should be admitted to the final examination unless he presents a certificate to the effect that he has attended such a course regularly and that his work in connection therewith has reached a satisfactory standard." Every one recognizes the futility of mere "signing up" in ophthalmology. Students, with an already overcrowded curriculum, will not devote much attention to a subject upon which it is unlikely that they will be examined. As a result they often become qualified with complete ignorance of such conditions as ophthalmia neonatorum, which, if inefficiently treated, are the cause of much defective vision or even blindness. Now that its own Examination Committee have come round to the opinion of ophthalmologists on this subject there is some hope of the acceptation of the British Council's recommendations by the General Medical Council.

Ophthalmologists are fully aware that the medical curriculum is overcrowded. Theirs is not the only subject which is crowded out: others are oto-laryngology and psychology. There is only one way of dealing adequately with the problem, viz., a complete revision of the curriculum. Hitherto, the curriculum has been intended to cover the requirements of *all* medical students, whether they are fated to become general practitioners or hospital physicians and surgeons. As a result the curriculum is unsatisfactory for both classes. In our opinion the qualifying curriculum and examinations should be directed to the turning out of thoroughly efficient general practitioners, and further study and examination should be demanded of those who specialize in the various branches of medicine and surgery. In this manner the time occupied by the curriculum for the registrable qualification might even be shortened. We are fully aware of the practical difficulties attending such a revision, but we are convinced that they are not insuperable. We respectfully suggest that the General Medical Council should take the bull by the horns and attack the whole problem anew on a broad basis.

The Bowman Lecture, 1921

Surely the shade of Bowman must have been hovering in the Royal Society of Medicine when Mr. E. Treacher Collins delivered the twenty-second Bowman lecture last May. The West Hall was packed to overflowing, the enthusiasm of his audience at the opening showed the esteem in which the lecturer is held by his fellow members of the Ophthalmological Society, their enthusiasm at the close their appreciation of the subject matter placed before them. When the aforesaid shade passed on his way, he must have felt that his immortal memory was being maintained in worthy fashion.

Mr. Collins took as his title, " Changes in the visual organs correlated with the adoption of arboreal life and with the assumption of the erect posture," and this is now reproduced with many of the original illustrations in the *Transactions of the Ophthalmological Society*, Vol. XLI.

Mr. Collins confined his remarks mainly to the differences in the visual organs of mammals, considering the requirements of the Herbivora, the Carnivora, the arboreal mammals and man; he discussed these variations in detail under several headings.

I.—*The field of vision*—A large monocular field is required where safety is ensured by rapid flight; one method of obtaining it is by marked prominence of the eye. In the Ungulata the outer margin of the orbit is composed of a complete projecting bony rim which serves to hold the eye well forward; in many of the lower mammals the outer margin is incomplete externally, whilst in Primates the outer wall is again bony, but does not cause prominence of the eyeball.

Some lower mammals can increase their monocular fields by increasing the prominence of the globe; this is effected by relaxation of the retractor bulbi muscle and by contraction of the muscle of Gegenbauer, of which a vestige in man is termed " Müller's muscle."

Increase in the size of the cornea relative to that of the eyeball must increase the field, and a diagram shows this relation in several species. The changes in the shape of the lens, and its size in comparison with that of the globe also alter with the requirements of a large or small monocular field. The laterally elongated pupil of the horse was observed to become converted into two circular pupils on exposure to bright sunlight, by the apposition of the pigmented bodies (corpora nigra) at the upper and lower margins. It is suggested that this is a mechanism for clearer vision without loss of panoramic field.

Further points under this heading are the laterality of the eyes and the amount of divergence of the optic axes, least when

binocular vision is present, greatest for panoramic vision. Recession of the snout, as one ascends the scale, allows the eyes to turn forwards, and the monocular fields to overlap. The Simiae and man alone amongst mammals have parallel optic axes. Overlapping of the monocular fields gives binocular vision, and attention is called to the overlapping of these fields posteriorly in some rodents, but a high angle gamma in the Herbivora may counteract this.

Binocular vision, consensual response of the pupil to light and conjugate movements are intimately associated with semi-decussation of the optic nerve at the chiasma. The question of the bifurcation of fibres from the macula is discussed.

A field of fixation comes into being with the development of central stereoscopic vision for form, and with this is associated an increase of mobility in the movements of eye and head in order to diminish the loss of panoramic vision from a small monocular field. Such mobility is most developed in man and the higher apes.

II.—*Light sense*—This is the most primitive of the visual functions. The lecturer accepts the " duplicity " theory of retinal activity and by it correlates the varying structures of the retina with the habits of different species.

The value of a tapetum is discussed, and the reasons why it has disappeared in arboreal dwellers and in man, who, for protection in darkness, took to caves and lake-dwellings.

III.—*Form sense*—Amongst mammals, this is most acute in the Primates, which alone have a true fovea. A fovea is also met with in some reptiles and in all birds. In monkeys, fine vision is required for the picking off of insects and fruit from the branches of trees.

IV.—*Accommodation and convergence*—These powers are intimately associated with the evolution of the fovea and with the adoption of arboreal life. Amplitude of accommodation is greatest in man, rather less in apes, and considerably less in the lower orders. This statement is strengthened by the reproduction of an interesting series of sections of the ciliary body in a number of mammals, showing variations in the size of the ciliary muscle and in the direction of its fibres. In the lowest mammals the muscle is practically non-existent. It is only in the Primates that the circular fibres are present, and in these there is a displacement outwards and backwards of the anterior part of the ciliary body owing to the disappearance of the " pillars of the iris " which attached the iris to the termination of Descemet's membrane. It is suggested that this displacement permits the innermost muscular fibres to develop in a circular direction. In myopia the flattening

of the ciliary body is due to stretching of the uveal tissue and the muscular fibres become mainly longitudinal.

There follows a comparison of the shape of the lens in various animals which shows that marked flattening of the anterior surface is only present in man and apes. This is correlated with the appearance of the pars plana in the same animals, and it is pointed out how, in the development of the pars plana, the posterior fibres of the suspensory ligament become drawn out and cause a flattening of the anterior lens surface by traction on the capsule. Loss of lens curvature is compensated for as regards refraction by increase of the corneal curvature and increased depth of the vitreous chamber.

With regard to movements of convergence, these are developmentally associated with acute central form-sense, with active accommodation and with stereoscopic vision.

V.—*Colour sense*—The majority of the mammalia appear to possess little or no colour sense. Experiments and experience show that this sense is only developed in insects, such as butterflies and beetles which feed on flowers, and in arboreal mammals which feed on fruits. A plea is entered for a careful watch for the chance of a microscopic examination of a colour-blind retina, in which there may be some abnormality in the shape of the cones at the macula.

VI.—*The protective mechanisms of the eyeball.*

(1.) The opening of the lids before birth in Primates is held to depend on the environment of the new born.

(2.) The third eyelid or nictitating membrane is most fully developed in the Ungulata; its rôle of sweeping the cornea is brought about by the contraction of the retractor bulbi or choanoid muscle, whilst the cornet, the muscle of Gegenbauer and a gap in the bony outer wall of the orbit also play a part in its mechanism. These appendages are absent in man and apes, owing to the failing need for a nictitating membrane, when the head is not used for grazing or hunting purposes. A discussion of the cause of proptosis in Graves's disease lays stress on the importance of Müller's orbital muscle, which is held to be a vestige of the muscle of Gegenbauer.

(3.) The caruncle is a vestige of the large odoriferous suborbital pit, most highly developed in those Ungulates which have a " distance sense " of smell.

The above résumé of Mr. Collins's lecture cannot do justice to this contribution to comparative ophthalmology, a branch of our science neglected by the average clinician. The whole is made up partly of a consideration of the writings of earlier workers, partly of original observations and deductions which give much food for thought. It concerns especially the changes in the visual organs caused by the altered environment of arboreal life, and those which resulted when man descended again to terra firma

and restarted the struggle for existence against his carnivorous foes. So many points are raised that it is impossible to review them all, one must refer the reader to the original in the *Transactions*, a study which will amply repay him. Many points in embryology, physiology, and clinical ophthalmology, arise and are discussed, and help to make the lecture of practical value to the clinician.

The Variability of the Coloration of Trout

In the autumn number of the *Journal of the Fly-Fishers' Club*, there is a short article on the variability of the coloration of trout, which is of some ophthalmic interest, by Dr. Barton, a very keen fly-fisher and naturalist.

It is well known that the trout, in common with other of the lower vertebrates, the frog and lizard for example, has the power of varying its colour according to its environment. The change is a reflex action and is produced by alterations in the distribution of the pigment in the cells of the superficial layers of the skin lying immediately underneath the transparent scales. When the pigment granules are gathered together in a central mass, the rest of the cell remains clear and transparent, and the general effect is a lightening of the colour. When the pigment granules diffuse through the cell, then the effect is a general darkening of the skin of the trout. The change seems to take about twenty minutes to complete, and, according to the writer, takes place, in normal conditions, as the result of light falling on the retina. So that if the head of the trout be in darkness the body remains dark, even though the body itself may be exposed to full light. Conversely, if the head be exposed to light and the body be in darkness, the body, nevertheless, lightens.

The same thing can be demonstrated in the frog, where it is easy to show that the change in colour is a reflex process in which the afferent impulses pass up from the retina.

In blindness, total or partial, the writer states, fish become dark, and in other variations in health, the tendency is for fish to turn black. So that all blind and unhealthy fish are black, but all black fish are not necessarily blind or unhealthy.

When the fish dies, the pigment collects into the centre of the cell and the fish becomes pale. Pressure alone will cause a dark fish to become pale, even before death. Trout fishers are well aware of this, and it is also suggested that the influence of shock will upset the reflex completely, but the evidence in support of this is not beyond suspicion.

BOOK NOTICES

Atlas of the Slit-lamp Microscopy of the Living Eye. By Dr. ALFRED VOGT. Translated by Dr. Robert von der Heydt. Chicago. Berlin: Julius Springer, 1921.

This is an admirably produced volume and reflects the greatest credit upon the author, artist, and publisher. It contains 38 plates, each plate consisting of about 10 drawings, mostly in colour. The drawings are all admirably executed and the colour reproduction is of a high grade of excellence. The letterpress consists of an introduction, chapters on technique and methods of examination, and a description of each drawing, with a few clinical details added in the case of pathological conditions. The chapters on technique and methods are very sketchy, and will not prove of great assistance to anyone beginning the use of the slit-lamp. These chapters might, with advantage, be further amplified, and more particularly a fuller description of the apparatus and of the methods employed to obtain the different forms of light bundles should be given. There is no mention made of the employment of contact lenses for the examination of the angle of the chamber and of the ciliary region.

The invention of the slit-lamp, which we owe to the genius of Professor Allvar Gullstrand, of Upsala, has opened up an entirely new field of investigation in ophthalmology. The method has already yielded some very interesting results, and promises to clear up many an obscure corner in the normal and pathological anatomy of the living eye. Gullstrand first brought the slit-lamp to public notice in 1911. The earlier publications of various observers referred to improvements in the apparatus and to isolated histological and pathological observations. During the war the whole subject suffered a temporary eclipse, and only recently has the matter been brought forward again. The literature of the subject is already assuming large dimensions, and the work now before us represents the first attempt to furnish a connected and systematic description of the normal and pathological appearances of the human eye as seen by this apparatus.

The slit-lamp, in its essence, is an instrument so devised as to enable an observer to project a very narrow beam of intense light upon that part of the eye which he wishes to examine. This indicates one of the limitations of the method. The area illuminated must, of necessity, be very small, and consequently the time required to examine any given structure, such as the whole cornea or iris, is correspondingly great. Owing to the high intensity of the local illumination and the absence of any aberrant

light it is possible to examine this area by means of some form of corneal microscope, using relatively high powers of magnification, up to 60 diameters and even 100 diameters under exceptionally favourable conditions. All parts of the eye, up to the retina, can thus be rendered accessible to minute examination, and it can, therefore, be understood how valuable this method may be. To show with what detail the parts may be studied it is stated that the individual cells of the endothelial lining of Descemet's membrane can be seen, and that the nerve supply of the cornea can be traced to its minutest ramifications.

The many drawings of the normal and pathological cornea are of great interest. The peculiarities of the lamination and suture arrangements of the lens are well shown. Many of the forms of cataract are illustrated, and it can be seen how, in different forms, the opacification starts from different layers of the lens and assumes differing shapes and appearances.

The structure of the vitreous is perhaps the most interesting revelation. The supporting fibrillar meshwork can be seen, and in most cases apparently many vestigial remains. Some fibres, remains of hyaloid arteries, are extraordinarily tortuous. The method will be specially valuable for the detection of the earliest changes in intraocular inflammations, more particularly for detecting the dust-like opacities in very early sympathetic ophthalmitis.

Later developments, adumbrated in this volume but since perfected, will render the retina itself accessible to this form of examination.

The value of the book is not diminished by the probability that in the light of future investigations many of the conclusions now reached will be modified or altered.

While recognizing the difficulties of translating such a work as this, owing to the necessity of finding new words and phrases to describe hitherto unknown appearances, it must be stated that the work of translation has not been well done, and the proof reading has been careless. Too many German words have been merely transliterated, e.g., inhomogeneous. Words are given meanings which they do not usually bear, as, for instance, in speaking of Nernst and gas-filled incandescent electric lamps the word " fibre " is constantly used where " filament " would be more readily understood. The use of the word " tubercular " where " tuberculous " is meant is perhaps too common to be specially mentioned, and following the German construction the use of the split infinitive is rather the rule than the exception.

In many instances no attempt has been made to adopt an English form of construction, and the following extract will serve to show

how curiously a German sentence may sound when translated literally :—" A further typic point of differentiation is furnished by the before-mentioned, varied-sized, large, scatteringly deposited droplets and delicate fibres, which are lymphocytes, or possibly amorphous clumps and fibres, and therefore found only on the posterior surface of the cornea."

Traité Complet de Thérapeutique Oculaire. By A. DARIER. 727 pp. Paris: Jouve et Cie, 1921.

This book, while naturally it embodies the author's previously published " Leçons de Thérapeutique Oculaire " (1901), is on a more ambitious scale than the earlier work. In the preface it is stated that the principal criticism of the latter has been that it was too personal. The present volume corrects that fault—if fault it was—and aims at " studying in detail all the methods, old and new. . . ."

It is only necessary to mention that there are 727 large pages in order to show the measure of the author's industry. There are indications, it is true, that the work might have been shortened without great loss of efficiency, but, since, taken as a whole, the book constitutes probably the most complete up-to-date treatise on ocular therapeutics, one admits that a certain amount of repetition and the inclusion of a good deal of what is general, and not merely ocular, therapy, adds to its usefulness and certainly to its readability.

In a book by Darier one naturally expects to learn much about biological therapy, and, although we in this country may not be so enthusiastic as the author, his account of the biological method from the therapeutic and from the diagnostic standpoint is welcome. It is exceedingly good.

The work is divided into two parts, the first, entitled " General Therapy," occupying 300 pages, the second, " Special Therapy." It must be understood, however, that while the first part is called " General " it bears reference, most of the time, to ocular diseases. Of this first part, the first chapter deals with the importance of precise diagnosis, the second is a supremely interesting account of biological therapy, the third discusses the various methods of administration of medicaments, namely, " Ingestion Entérale " by the stomach or rectum, and " Injection Parentérale "—hypodermic, intramuscular, intraspinal, subdural, intraventricular, and intravenous; and also deals with subconjunctival injections. The fourth and fifth chapters are concerned with the general medication employed in eye diseases. What the author has to say about mercurial and arsenical therapy constitutes a small treatise in

itself. Chapter six deals with the action of heat and cold, with Bier's method, electrotherapy, radiotherapy, and massage of the eye. The seventh chapter gives details of local applications; anaesthetics, mydriatics, miotics, and so on.

The second part of the book takes up the various diseases of the eye in turn, and need not here be summarised. Actual operations are not fully described. Thus, in dealing with senile cataract the author says, " The technique of the operation will be found in every treatise on ophthalmic surgery, but many little details can here be discussed." For example, operation on one eye when the other is healthy, and when it has incipient cataract; the question of operation on both eyes at one time; preliminary iridectomy or not, and so forth. The complications of operation are also considered. In fact, nearly everything, except the operation itself, finds a place. The reviewer, however, has not been able to find in this chapter any definite reference to pre-operative bacteriological examination of the conjunctiva. Conjunctival and other contra-indications are mentioned, and also their treatment preliminary to operative interference. The nearest the author seems to come to this matter is the following sentence :—" When one is quite certain that the eye is in good condition for operation, it becomes necessary to ascertain whether the patient suffers from any source of infection." The chapter on glaucoma is good. The etiology, the classification of the different forms, and the medical treatment are considered. The author is strong on the discrepancies which occur in manual estimation of tension, and favours the Schiötz tonometer. Diagnostic difficulties are not a strong point in this chapter, and one may assume that the author did not wish to occupy too much space with this subject in a book dealing with therapeutics. A similar explanation would account for the apparent omission referred to above in connection with cataract. The principal operative measures referred to are iridectomy, the Lagrange and Elliot operations, iridotasis, cyclodialysis, and sclerotomy. One gathers, rather by inference than otherwise, that the author is, in the main, an adherent to the first-named operation.

The book, as one would expect, contains only a very few illustrations. There are, on the other hand, a number of detailed prescriptions in the text, and the reviewer thinks it would be wise for the British reader to confirm the details of drugs and dosage in accordance with the British Pharmacopoeia. This is especially necessary since the text suffers very greatly from typographical errors.

With regard to general make up, the volume is paper covered and therefore fragile in use. There is a paged index at the beginning, a summary of contents at the heading of each chapter,

a repetition of the chapter headings at the end of the volume (without, strangely enough, any reference to the pages at which the chapters commence); also a " Repertoire Memento " giving, under the names of diseases, the pages upon which these are discussed, and, finally, an " Index Medicamentarius," giving the characters of each drug and, sometimes, the dosage.

Darier's treatise can be very confidently recommended to British ophthalmologists. It contains an enormous amount of information on treatment, in which branch Darier is an enthusiast and past master, and it is elegantly written.

CORRESPONDENCE

THE INTERIM REPORT OF THE COMMITTEE OF THE MINISTRY OF TRANSPORT ON LIGHTS ON VEHICLES

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—Although hardly a suitable subject for a long argument, as the author of the Annotation on the Interim Report of the Committee of the Ministry of Transport on Lights on Vehicles, I should like to reply to some remarks made by your correspondent, Dr. Ernest Thomson, on the question of turning out or dimming of headlights when one car is passing another. No doubt, on a very dark night or in the rain the turning out of the headlight is both dangerous and useless, but on a fine night when there is a certain amount of light, the practice is undoubtedly of service. Both on dark nights and light nights the dimming of lights is much more satisfactory, but switches which dim the lights are not fitted to all cars, as I suggested they might quite well be. All these methods are not without strong objections, and the suggestion is made merely as a temporary measure to mitigate the danger until such a time that properly-designed lamps have come into general use.

Yours faithfully,
M. S. MAYOU.

HARLEY STREET, W.1.

NOTES

Office-Bearers of the Ophthalmological Society of the United Kingdom

THE following gentlemen were elected office-bearers of the Ophthalmological Society at the Annual General Meeting held on May 7, 1921:—President: J. Herbert Fisher, M.B. Vice-Presidents: J. B. Story, M.B., J. Herbert Parsons, C.B.E., F.R.S., Harold B. Grimsdale, M.B., Cyril Walker, M.B. (Bristol). Treasurer: Sir Arnold Lawson, K.B.E. Council: M. S. Mayou, A. R. Brailey, M.B., C. B. Goulden, O.B.E., M.D., R. R. James, H. M. Traquair, M.D. (Edinburgh), T. Harrison Butler, M.D. (Birmingham). Secretaries: F. A. Juler, M.B., J. F. Cunningham, O.B.E.

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Congress of the Ophthalmological Society

THE Annual Congress of the Ophthalmological Society will be held later than usual, in order that it may not clash with the congress at Washington, D.C. The dates are May 11, 12 and 13.

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Annual Dinner of Moorfields Hospital

THE Annual Dinner of past and present students of the Royal London Ophthalmic Hospital will be held at the Langham Hotel, Portland Place, on Thursday, February 9, 1922, at 7 for 7.30 o'clock, under the chairmanship of Dr. James Taylor, Consulting Physician to the Hospital. Tickets (excluding wine) 15/-; applications should be made to Sir William Lister, 24, Devonshire Place, W.1.

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Workmen's Compensation Act, 1906.

THE Home Secretary has made an order under Section 8 of the Workmen's Compensation Act, 1906, extending the provision of that section to cases of cataract caused by exposure to rays from molten or red-hot metal, which are specially liable to occur among workers engaged in the manufacture of steel or iron. A worker suffering from cataract shall be entitled to compensation under the provisions of the said section for not more than six months in all, and for not more than four months unless he has undergone an operation for cataract.

This order has been issued in view of the finding of the Committee of the Royal Society, which has been investigating the causation of glass workers' cataract, that the same, or a very similar form of cataract is also found among workers in the iron and steel trades who are exposed to glare from molten or red-hot metal.